**Study of electronic characteristics of heterojunction with intrinsic thin-layer devices and defect density profile of nanocrystalline silicon germanium devices**

**ABSTRACT**

 Heterojunction with Intrinsic Thin-layer (HIT) solar cells are an important photovoltaic technology, recently reaching record power conversion efficiencies. HIT cells hold advantages over the conventional crystalline Si solar cells, such as their fabrication at lower temperatures and their shorter fabrication time. It is important to understand the electronic characteristics and transport properties of HIT cells to continue to improve their efficiencies. The fundamental measurements of a HIT cell fabricated on a p-type wafer are presented. We also report on a series of HIT cells fabricated on wafers with different doping concentrations, observing the relationship between doping and characteristics such as open-circuit voltage and diffusion length.

 Nanocrystalline Silicon-Germanium (nc-SiGe:H) is a useful material for photovoltaic devices and photodetectors. The material features good absorption extending to the infrared region even in thin layers. Its bandgap can be adjusted between that of Si (~1.1 eV) and Ge (~0.7 eV) by varying the alloy composition ratio during deposition. However, there has been very little previous work to measure and understand the defect density spectrum of nc-SiGe:H. Defects are responsible for controlling the recombination and thus the performance of solar cell devices. Capacitance-Frequency measurements at various temperatures are used in order to estimate the trap density profile within the bandgap of nc-SiGe:H.